Jaguar X308 Bluetooth Phone Install

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Overview

This article documents the installation of a Motorola T605 Bluetooth Car Kit in a USA spec 1998 Jaguar XJR. The installation will be the same or very similar in any Jaguar X308. The first generation XK will be similar but the connector and some of the wiring is slightly different.

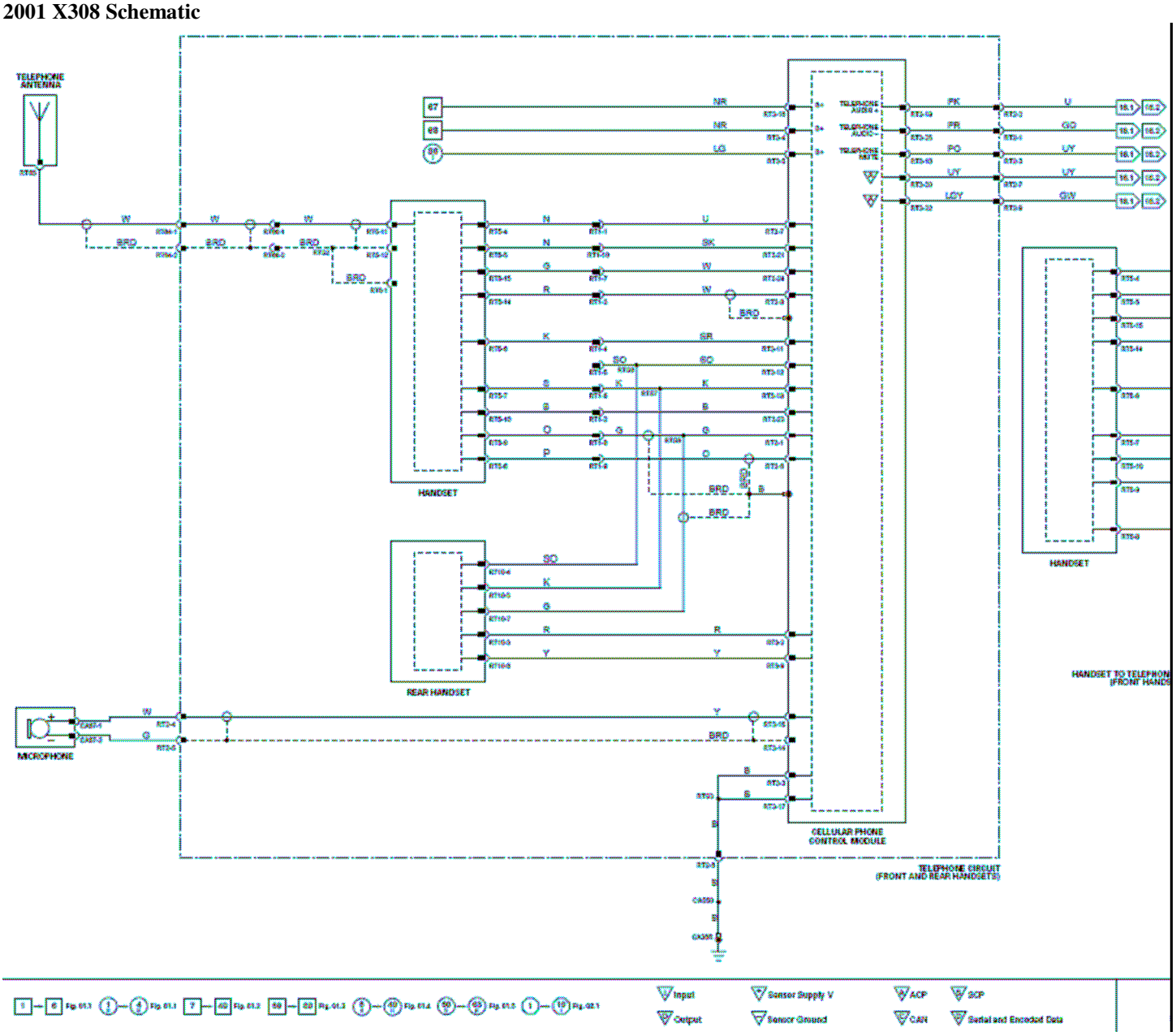
Basic Connections

The factory stereo system in the 1998 through 2002 XJ can be easily adapter for an aftermarket Bluetooth car kit now. Other years and models are similar. Several have been successfully installed making full use of the mute when a call comes in, the line input to the factory stereo for the phone audio output, and the factory mic. All the required wiring exists under the center console. Look on the schematic for connector RT2 (a white 10-pin 2-row connector). The pinout is as follows:

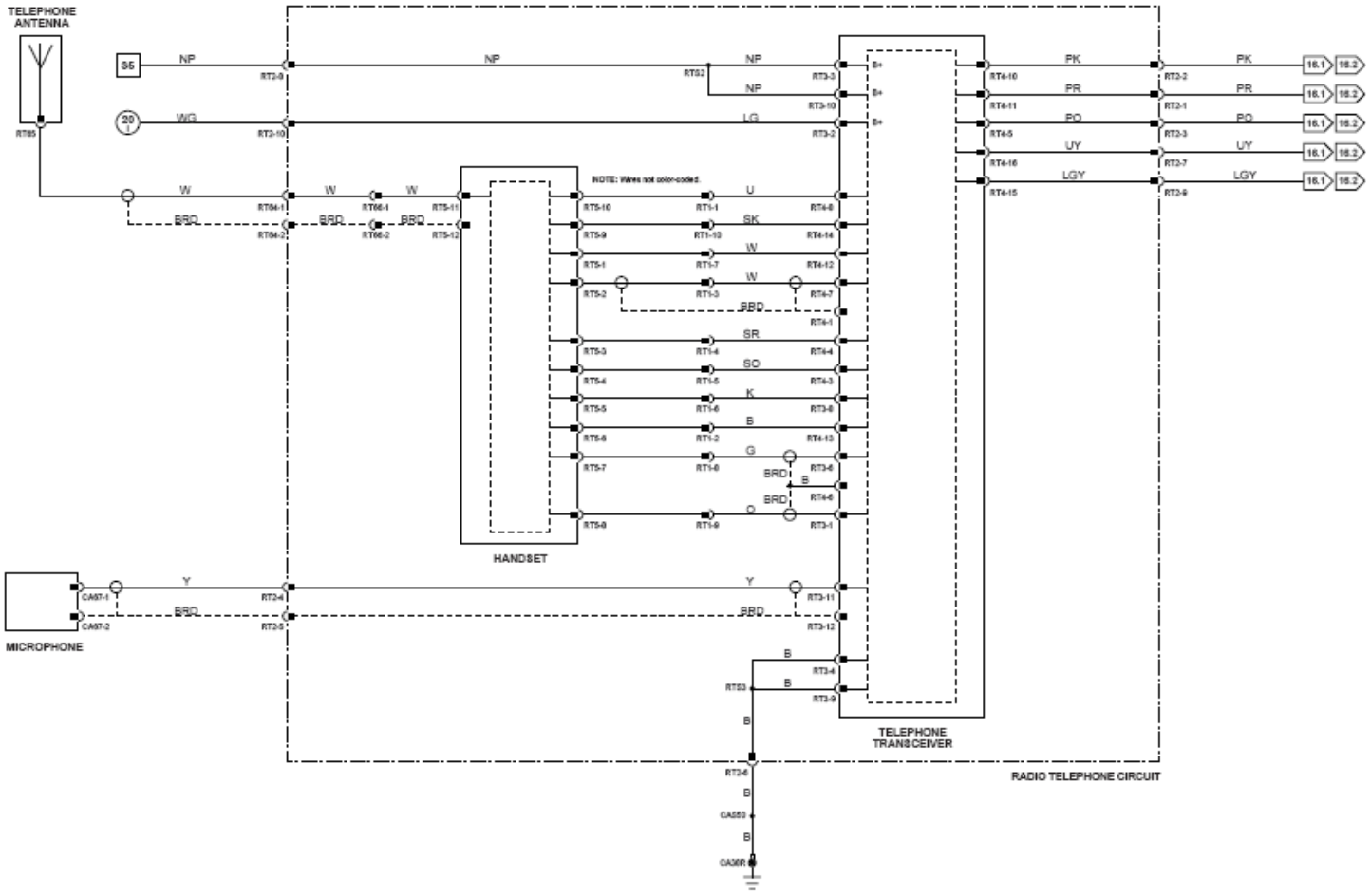
RT2-1 = Purple/Red Audio input from phone to stereo line level negative
RT2-2 = Purple/Pink Audio input from phone to stereo line level positive
RT2-3 = Purple/Orange Ground this wire and the radio will switch from music to the phone audio through the cars speakers. Most car kits have a wire for this that does ground to mute so you can connect directly to this wire.
RT2-4 = Yellow Factory mic positive lead
RT2-5 = Braid Factory mic negative lead
RT2-6 = Black Ground
RT2-7 = Blue/Yellow ACP network positive.
RT2-8 = Brown/Purple Battery positive at all times fed from fuse #5 (5A) in the RH heelboard fusebox.
RT2-9 = Light Green/Yellow ACP network negative. Note: the ACP network is used for the radio button features for the phone.
RT2-10 = White/Green Key switched power fed from fuse #10 (5A) in the RH heelboard fuse box.

If you look into the face of the 10-pin connector, pin #1 is at the top left and pin #10 is at the bottom right. The pins are numbered from left to right, top to bottom.

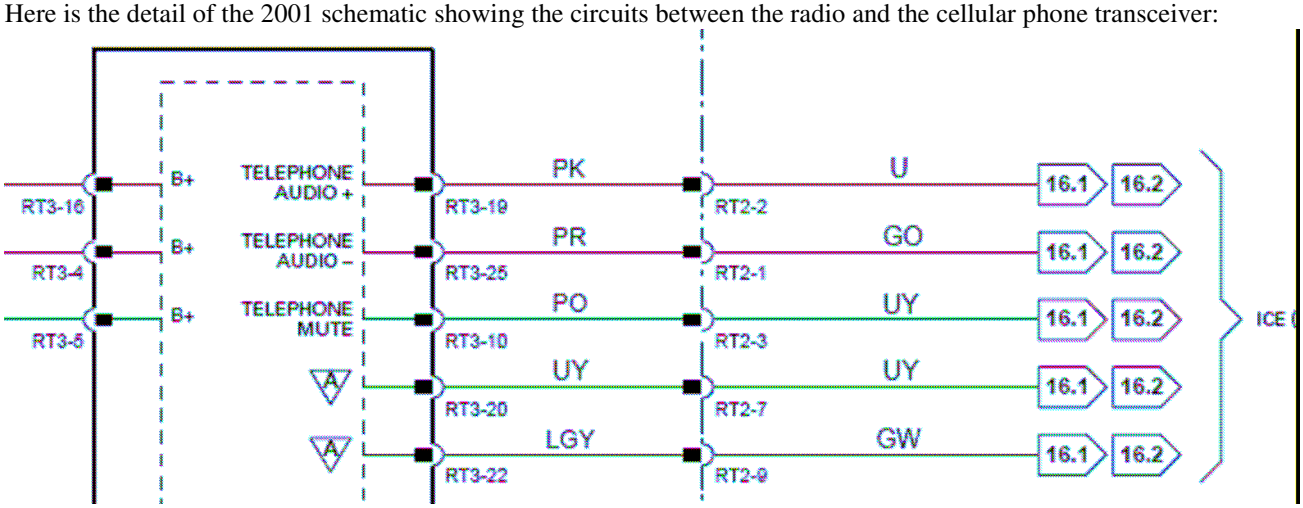
2001 X308 Schematic



The schematic above shows the 2001 X308 cellular phone wiring. The 5 wires going to the radio head unit are at the top right. The battery and key switch wiring differ slightly from the 1998 schematic which shows these wired through RT2. Below is the 1998 schematic:

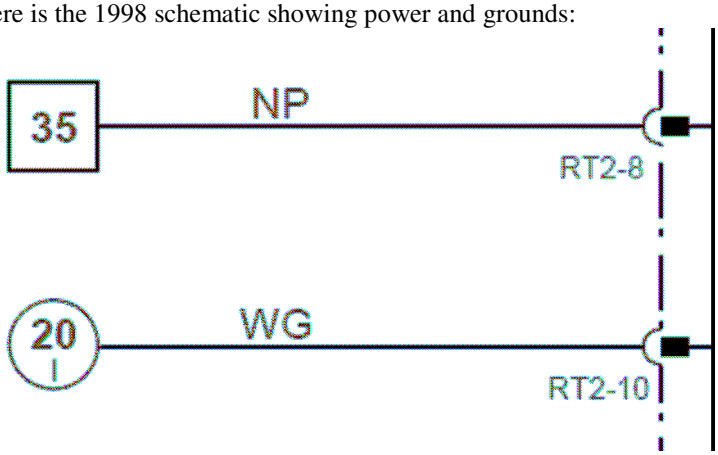


Here is the detail of the 2001 schematic showing the circuits between the radio and the cellular phone transceiver:

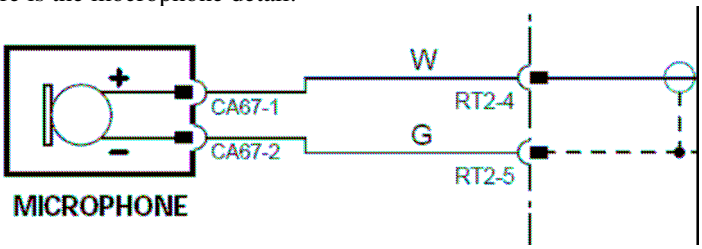


The mute wire (pin RT2-3) is grounded by the cellular phone transceiver when a call is received and during a call. When this wire is grounded, the radio will switch the audio input from music to the line level audio input wires (RT2-1 and RT2-2) allowing the phone to be heard through the stereo speakers. The radio will show “PHONE” across the display while the mute wire is grounded.

Here is the 1998 schematic showing power and grounds:



Here is the mocrophone detail:



The microphone wiring runs from connector RT2 up to the roof console. Remove the roof console by opening the sunglasses holder and twist the plastic mounting pin 90 degrees. Once removed, you will see connector CA67, a blue 2-terminal connector. Connect the microphone for the car kit here.

Here is the wiring color scheme:

Wiring Color Codes

N	Brown	O	Orange
B	Black	S	Slate
W	White	L	Light
K	Pink	U	Blue
G	Green	P	Purple
R	Red	BRD	Braid
Y	Yellow		

When a wire has two or more color code letters, the first letter indicates the main color and the subsequent letter(s) indicate the tracer color(s).

The 2001 X308 had a fixed phone option which was mounted in the trunk (boot). Everything else was the same as the earlier models.

Component	Connector / Type / Color	Location / Access
CELLULAR PHONE CONTROL MODULE (FIXED PHONE)	IC25 / TELEPHONE / PROPRIETARY	RH TRUNK
TELEPHONE ANTENNA	RT6 / COAXIAL CONNECTOR RT7 / COAXIAL CONNECTOR	BELOW CENTER CONSOLE GLOVE BOX HEATED BACKLIGHT / HEADLINING / REAR
TELEPHONE HANDSET – FRONT	RT3 / TELEPHONE / PROPRIETARY	CENTER CONSOLE
TELEPHONE MICROPHONE	CA67 / 2-WAY MULTILOCK 040 / BLUE	ROOF CONSOLE

HARNESS-TO-HARNESS CONNECTORS

Connector	Type / Color	Location / Access
RT2	10-WAY MULTILOCK 070 / WHITE	BELOW CENTER CONSOLE GLOVE BOX

GROUNDS

Ground	Location / Type
CA38R	EYELET (PAIR) – LH HEELBOARD POST GROUND SCREW

The X308 has an AMP Multilock white 10-pin type 070 connector. The AMP part number is 174465 (plug). You can get the mating connector AMP part number 174932 and the related terminals if you wanted to make a handy harness and not cut the factory wiring.

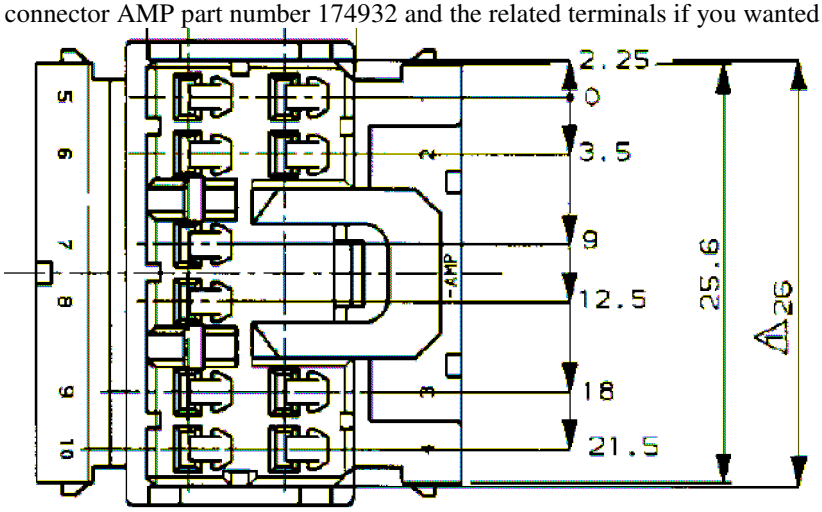


Figure 1 - AMP 174465 Connector (factory installed in vehicle RT2) looking into face

The XK's have a 14-pin connector with similar color codes but 3 mic wires (a dedicated return and a braid) and some other minor differences.

Motorola T605 Bluetooth Car Kit

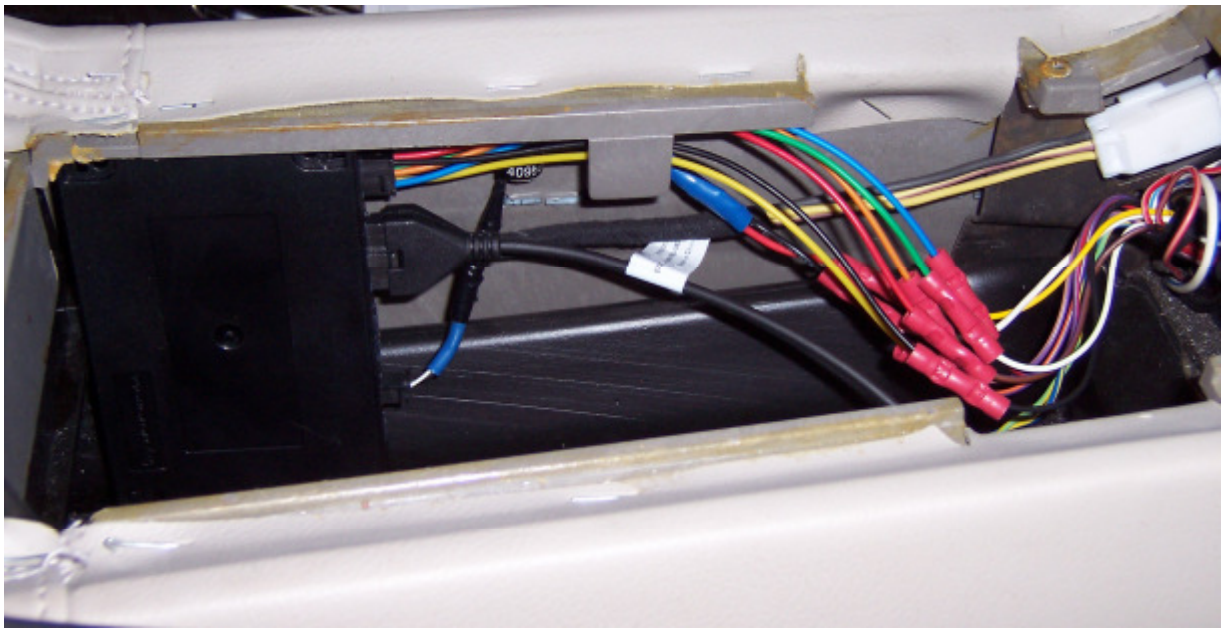
This section covers the specifics of installing the Motorola T605 Car Kit. Other Motorola car kits (like the HF850) are similar. Here is the wiring for the car kit in the Jaguar X308.

Description	Motorola T605/IHF1000	Motorola HF850	Jaguar X308
Audio line input negative (-)	(6-pin) Blue		RT2-1 purple/red
Audio line input positive (+)	(6-pin) Orange		RT2-2 purple/pink
Mute	(6-pin) Yellow*	(6-pin) Orange	RT2-3 purple/orange
Microphone positive (+)	(2-pin microphone) White	(2-pin microphone) White	RT2-4 yellow
Microphone negative (-)	(2-pin microphone) Braid	(2-pin microphone) Braid	RT2-5 white
Ground	(6-pin) Black	(6-pin) Black	RT2-6 black
Battery positive (+) (hot at all times)	(6-pin) Red	(6-pin) Red	RT2-8 brown/purple
Key switch (+) (hot with key ON only)	(6-pin) Green	(6-pin) Green	RT2-10 white/green

Note: The HF850 has to more wires that are not explained in the manual but are believed to be line out but this has not been confirmed. If it is not line out, a speaker level to line level adapter can be used. You can find these at electronics stores.

*Note: Some T605 wiring harnesses swap the yellow and orange wires. If the mute function does not work confirm which wire is the mute line using a test lamp connected from a 12VDC power source and each of the yellow and orange wires. The lamp should illuminate when the hands free communication is active (making a call, answering a call, etc).

The car kit control module can easily fit to the side of the compartment below the armrest glove box. See photo.



All the wiring you need is in the 10 pin connector on the Jaguar. The fuses supplied with the car kit are not needed because the circuits already have appropriate fusing (5A each). Most of the Motorola car kit harness can be cut away and discarded. You only need about 8 inches of wire from the 6-pin connector to connect to the X308 wiring.

The microphone connects to a different connector on the Motorola car kit module. It is a 2-pin connector. Use the microphone supplied with the Motorola car kit. You will need to modify the wiring to utilize the factory installed microphone wiring rather than routing your own. Start by cutting the microphone wiring about 12" from the microphone. Then cut the connector end off about 8" from the connector. The microphone wiring is actually a coax in both the Motorola car kit and the Jaguar X308. Since the wires are so small, crimp connections are not advised. Instead you will need to solder and heat shrink these connections. I connected a couple inches of wire to each of the microphone wires, soldering and heat shrinking the connections to the coax. On the connector end I crimp connected these wires to the X308 wiring from the RT2. On the microphone end I used a terminal block to connect the X308 wiring to the microphone.

I mounted the microphone by clipping it to the headlines on the drivers side of the roof console. See photo below.

The Motorola control pad needs to be mounted in a place that the driver can easily access it. It can double back tape on it so you can stick it to any smooth surface. I chose to attach it to the drivers side of the trim around the center A/C registers.

I routed the wires behind this trip panel toward the drivers side of the car, then behined the instrument panel trim. From there I routed it to the center console to the car kit module. There is plenty of room to pull the 8-pin connector through. You must however, remove

the IP trim, center console trim (around shifter and radio), and radio for access. I used a piece of coat hanger to help pull the wire through from behined the instrument panel trim to the center console. See photo below.

Once I had the connector in the center console area, I used a piece of flexible concuit to pull the wiring through to the area where the car kit is mounted. I did this by inserting the conduit from the area where the kar kit is mounted forward to the area near the shifter. Then I taped the wiring to the conduit to pull it back through. Anything semirigid but flexible will work for this. Now, connect the control pad wiring to the module and reassemble everything.

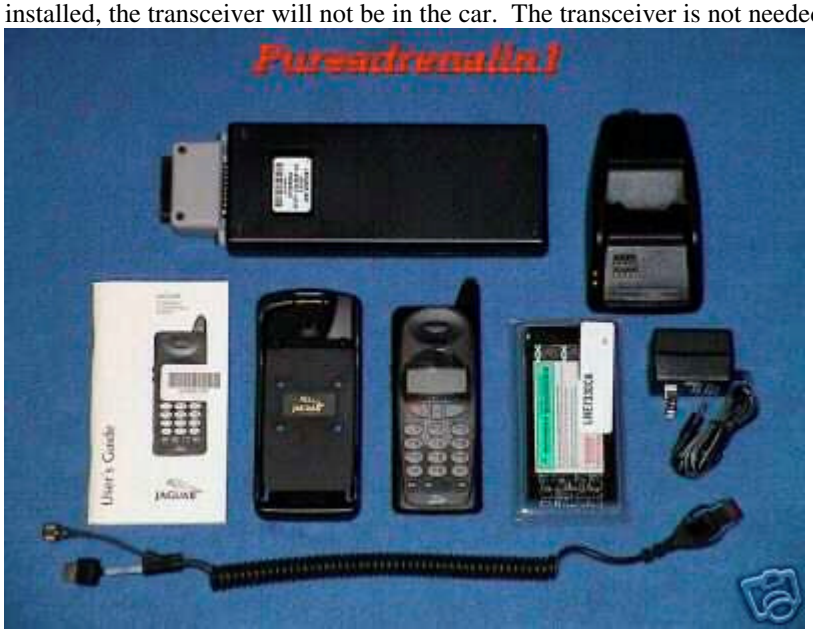
Follow the instructions to pair the car kit to your phone. When a phone call comes in, the raio will display “PHONE” on the screen and the audio will be routed from the phone. It does not matter if you had the radio ON or not. You can set the volume all the way up on the Motorola control pad and use the radio volume to control it from there. The radio will remember the phone volume setting separately from the volume when the raio plays music. Also, you can adjust the fader in phone more and that will be used only in phone mode. In other words, the Jaguar radio will remember your settings in phone mode and use them only in phone mode. In music mode your music settings will be used. Anytime you use the phone, it will override the radio. The phone will temporarily override the radio on every startup and during paring for a couple seconds as well. Once paired it will beep and then return back to radio (or OFF if that is where it was before).

Parrot Bluetooth Car Kit

I found a very detailed article about a similar install of a Parrot kit. You can see that here:
http://www.vis1.co.uk/jag/

Factory Phone Details

The factory phone for the X308 was a special Motorola StarTAC 130 made for Jaguar. It had special firmware that worked with the transceiver in the car. You could not use another Motorola StarTAC 130 in the car because it would not be compatible with the special Jaguar version. The transceiver was part of the kit. If you did not order the phone with the car, or have the system dealer installed, the transceiver will not be in the car. The transceiver is not needed to install an aftermarket car kit.



MODEL NUMBER: LNE7312AA
FCC ID: IHDT5WW1
CANADA: 109 182 288A
TYPE: WWKA

ACP Network

Pins RT2-7 and RT2-9 are for the ACP communications buss. RT2-7 appears to be the high side (positive) wire and RT2-9 the low side (negative) wire. There is a heartbeat sent on this link to communicate with the radio. The radio send commands across this link when phone buttons are pushed on the radio or steering wheel. If this communications protocol were to be deciphered, full integration of aftermarket car kits could be achieved. ACP stands for Audio Corporate Protocol and it is common to the Ford family of automobiles. This network has also been called ACB or Audio Corporate Buss. It uses UART technology. A similar protocol called SCP (standard corporate protocol) was an offshoot of SAE J1850 PWM. SCP is a 41.6 Kb/s PWM (Pulse Width Modulation) type which uses a two-wire differential bus.

I found this at http://www.mictronics.de/?page=cdc_proto . Somebody was hacking the ACP network to use for a CD changer. They have documented the ACP network quite well. Here is a sample of that information but it includes a paper on the ACP protocol, source code to use the network, and much more.

Ford ACP

The following information are taken from Andy Hammonds Yampp3/USB MP3 player firmware with ACP protocol support.

Download
(http://www.mictronics.de/download/yampp3u/yampp3_ACP_v131.zip)

Ford ACP is a network protocol used by the Head Unit to communicate with and control audio devices such as the Ford 6 disc CD Changer and the Nokia integrated cell phone or Ford Telematics units.

It is based on RS485 with 9 bit character data at 9600 baud.

A MAX-481 low power RS485 transceiver will work as interface between a serial USART and ACP bus.

Pin Function
1 ACP +
2 ACP Shield
3 GND
4 n/c
5 Audio Left +
6 Audio Right +

7 ACP -
8 CDENABLE
9 +12V Power (unfused)
10 Audio Shield
11 Audio Left -
12 Audio Right +

You will need an AMP plug to connect to the head unit.
AMP Multilock Series 40 cable connector housing with 12 pins or sockets.

The CDENABLE line is 0V when the radio is off and +10V when it is on and can be used as a standby switch for the yampp.
It is not a power supply and can't drive a relay directly.

Communication

* a delay of 1642us (16 Bit times) will indicate a start of new message
* the 9th bit in a byte must be set in the last byte of message to indicate the end of message
* Acknowledge is given with 0x06

Byte 0 - Medium/Priority, should be 0x71

Byte 1 - Changer functional address, should be 0x9A or 0x9B

Byte 2 - Head unit address, 0x80 on receive, 0x82 on transmit

Byte 3 - Command control byte

*
  0xE0 - Handshake 1, byte 4 should be 0x04
* 0xFC - Handshake 2, byte 4 must be the same for transmit and receive
* 0xC8 - Handshake 3, byte 4 must be the same for transmit and receive
* 9xFF - Current disc status in byte 4
    + Byte 4 - 0x00 Disk OK
    + Byte 4 - 0x01 No disc in current slot
    + Byte 4 - 0x02 No disc at all
    + Byte 4 - 0x03 Check current disk
    + Byte 4 - 0x04 Check all disc
* 0xC2 and 0xD0 - Change or request current disc

+ Byte 1 - 0x9A - command to change disc
+ Byte 1 - not 0x9A - request current disc
+ Byte 4 - disc number

* 0xC1 - Control command
+ Byte 4
# Bit 0 - Fast search
# Bit 1
# Bit 3
# Bit 4 - change Random status
# Bit 5 - change Loudness status
# Bit 6 - change Play/Stop status
# Bit 7
+ Send back byte 4 with actual mode

* 0xC3 - Next track
+ Byte 4 - Track number

* 0x43 - Previous track
+ Byte 4 - Track number

The last byte in all message is a checksum of all previous bytes. Simply add all bytes of message to calculate the checksum.

Ford Audio Control Protocol (ACP) Specification
(http://www.mictronics.de/download/CDC_Protocols/FORDs_ACP_Protocol.zip)

Simon Fisher source code package for ACP monitor/logger/interface
(http://www.mictronics.de/download/CDC_Protocols/acpmon.zip)

I also found an ACP gateway that could possibly be used to interface with the cellular functions. It is from a company called Dension. The call it a Dension Gateway 100 – Ford ACP. You can find details here:
http://www.geniosactivos.com/product_info.php?cPath=26_191_454_405&products_id=100024

Connection to the Stereo Audio

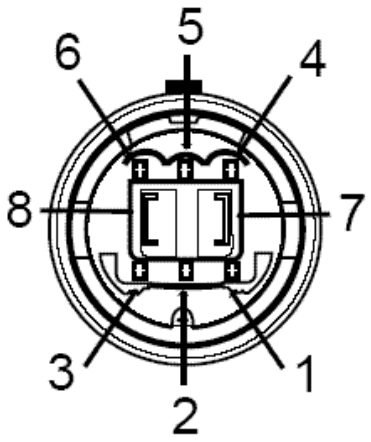
The Motorola T605 also has bluetooth stereo so you can use it to stream music to the car stereo system. The CD-Changer in the car wore out to where it just skipped all the time so I needed to replace it. CD-Changers are pretty much obsolete now so I wanted to take advantage of the bluetooth stereo instead. The factory CD-Changer is made by Alpine and connects to the head unit using Alpines Ai-Net communications and cables. Alpine still makes CD-Changers with Ai-Net so I considered just buying a new one. However I read on some forums that these aftermarket Alpine units connects and power up but the Jaguar head unit ignores them so you can't switch to the CD input with them connected.

My first attempt to connect to the changer was to use an Alpine auxiliary input adapter. It basically just connects the stereo audio leads using the Ai-Net connector to 2 RCA jacks. This did not work since the head unit would not recognize that anything was connected so it would not switch to the CD input.

Since my CD-Changer was bad anyway, and I really wanted to use bluetooth stereo instead, I figured there was no loss to hacking up the CD-Changer to use the audio from it and just leave everything else connected tot he changer so the head unit would be happy. I started by opening up the CD-changer and determining which wires were what. Below is a picture of the Ai-Net connections.

B Ai-NET Connector

1	Accessory
2	Ground Bus
3	Data Bus
4	Right Signal
5	Signal Ground
6	Left Signal
7	Battery
8	Power Supply Ground



B

Ai-NET Female Connector

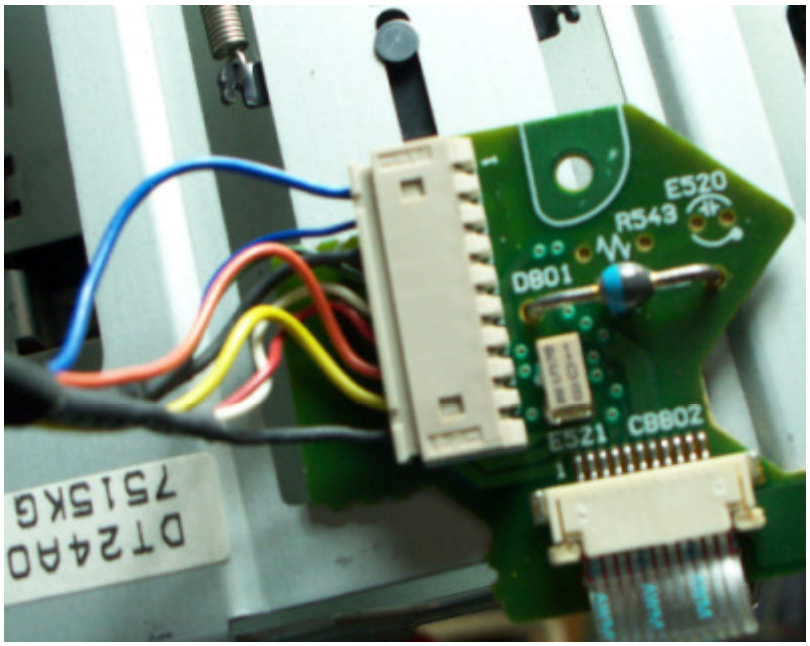
Inside the CD-Changer the Ai-Net connections go to a small circuit board with a 9-pin white connector. The detals of that connection is below.

Jaguar CD-Changer

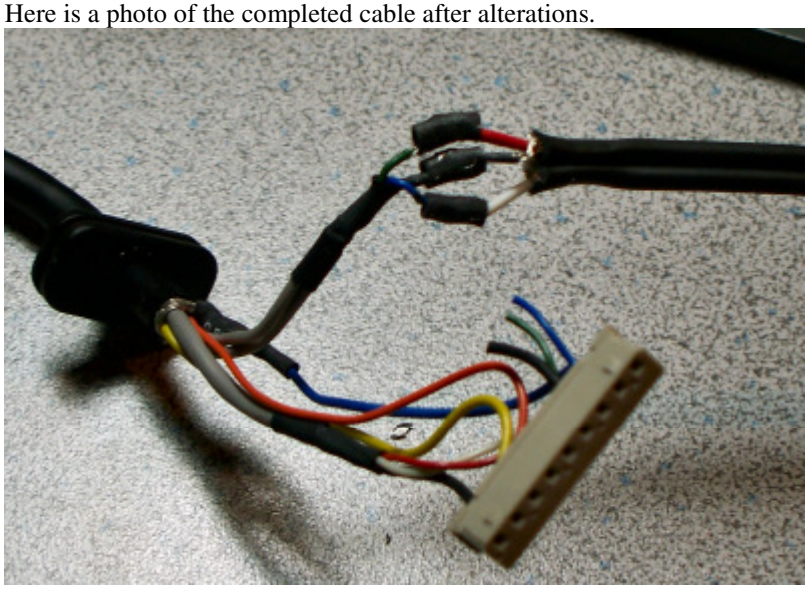
Description	Inside conn color	Ai-Net pin#	Inside Pin#
Accessory	orange	1	7
Ground Bus	white	2	5
Data Bus	red	3	6
Right signal	green	4	4
Signal ground	black	5	3
Left signal	blue	6	2
Battery	yellow	7	8
Power ground	black	8	9
Shield	blue		1

Note: the green dot on the white 9-pin connector is opposite pin 1. Pin 1 also has black wire. The board has pin 1 marked.

The photo below shows this circuit board and the white 9-pin connector.



Here is a photo of the completed cable after alterations.



Now I reassembled the CD-Changer and installed it back in the car. I now have regular RCA jacks to connects to any audio source. When you switch the head unit to the CD-Changer the audio signal from these new wires is played through the car stereo. The head unit reports whatever the CD-Changer is doing. For instance, you can just leave the magazine out of the changer and the head unit reports “no magazine” but the audio still works.

Now that I have this auxiliary audio input, I connected it to the stereo output wires of the T605 bluetooth kit. The T605 also has an auxiliary input so you can pipe musing through it into the car stereo. If my CD-Changer still worked, I could connect the 3 wires from the white connector (blue, green, and black) to another set of RCA jacks and then connected these to the T605 stereo input connector (using the appropriate adapters). That would allow the CD-Changer to still work and have the bluetooth.